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THE DAIRYING AND FRUIT GROWING INDUSTRIES IN CANADA

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I. THE DAIRYING INDUSTRY

HISTORICAL Development. The dairying industry in Canada dates back to very early times. Champlain established a dairy farm on the banks of the St. Lawrence very shortly after he founded his colony at Quebec in 1608. Subsequent importations of the best stock of Normandy and Brittany were brought to Canada at different times during the seventeenth century. The Acadians, in what is now the Maritime Provinces, also became possessed of a considerable number of domestic cattle during this period, and in the year 1671 there were reported to be 866 head of "horned" cattle in all Acadia. There were 1557 cows and over 5,000 young cattle at the Basin of Minas alone at the time of the expulsion of the Acadians in 1755.

During the eighteenth century, some live stock, including milch cows, was brought to Nova Scotia and New Brunswick by settlers from New England, and after the Revolutionary War, the United Empire Loyalists also brought cows into Ontario and the Eastern Townships. A certain number of cows were distributed among the Loyalists by the Government during the years 1783, 1784 and 1785.

Cows were introduced into the Prairie Provinces in 1823 when a herd of 300 cattle was driven up from the United States and disposed of to the Red River colonists. Cows were to be found at the Hudson Bay posts as far west as the northern interior of British Columbia as early as 1837. In 1846 the Hudson's Bay Company had two dairy farms established at Fort Victoria, on Vancouver Island. The cattle on these farms were descended from the stock originally procured by the Company from the Mission Fathers in California for its posts on the Columbia River. The Fathers brought them from Mexico and they were, therefore, of Spanish origin. It follows that the common cow of Canada is of rather mixed ancestry. By the beginning of the nineteenth century, there were probably about 100,000 cows

in the whole of British North America. The number increased rapidly from that time forward.

During the seventeenth century, Nova Scotia possessed a larger number of cattle than any of the other territorial divisions now known as provinces of Canada, but after 1800, Lower Canada, (Quebec) took the lead and continued to hold it until about 1850 when the rapid development of Upper Canada (Ontario) gave that province first place in cow population, a position which is still maintained. In 1871 the number of milch cows had increased in Ontario, Quebec, New Brunswick and Nova Scotia to 1,251,209 head and the census of 1901 showed that the number had practically doubled in Canada during the intervening 30 years. The increase in milk production during the same period was relatively greater than the increase in the number of cows, owing to the marked improvement in the breeding and care of the animals.

Production of Butter and Cheese.—In the early sixties the production of milk and butter so far exceeded the local demand that prices were unsatisfactory and the dairying industry seemed to have reached a point when further progress was impossible. The introduction of the factory system of manufacturing cheese saved the situation by making an export trade possible. The first cheese factory in Canada was established in Oxford County, Ontario, in 1864. During the following year, a factory was opened in Missisquoi County, Quebec. The number of factories multiplied rapidly until about the year 1900. The production of cheese reached its maximum in 1904. The first creamery was established in Canada in Huntingdon County, Quebec, in 1873. Other creameries followed in rapid succession in both Ontario and Quebec, and, as a result, the manufacture of butter on the farm has almost ceased in some parts of the country. There is practically no cheese made on farms in Canada, but there is a large quantity of butter produced on farms in some districts. The latest returns show that there are about 3,600 factories and creameries in Canada, distributed throughout every province, but over 3,000 of the total number are in Ontario and Quebec.

Exports.—An export trade in butter had existed in a small way for over 100 years. Nova Scotia shipped both butter and cheese to the West Indies early in the nineteenth century. It was not, however, until after the establishment of the cheese factories that the export of dairy produce from Canada became of much importance. The first export shipment of factory cheese was made in 1865. In 1868 the quantity had increased to over 6,000,000 pounds and the succeeding years showed a fairly regular increase until the record year of 1904, when 233,980,716 pounds were exported. The export of butter in 1868 was 10,649,733 pounds. The amount fluctuated between ten and twenty million pounds annually down to 1882 when

it rapidly declined until in 1889 the amount exported was less than two million pounds. With improved methods of manufacture and better facilities for the storage and transportation of butter, the export trade again revived and reached its maximum in 1903 when 34,000,000 pounds were exported. Since 1903 the consumption of milk and its products in Canada has increased more rapidly than production, with the result that there has been a somewhat diminishing surplus for export during the past 9 years. As a matter of fact, the importation of butter into Canada during the past year from New Zealand has amounted to a very considerable quantity. For the first time in 60 years there has been no butter exported to Great Britain during the season of 1912. The shipments to the United States, West Indies and Newfoundland for 5 months ending August 31st, were only 418,552 pounds. The total value of dairy produce exported in 1903 was $31,000,000. For the fiscal year ending March 31st, 1912, the total value of all dairy products exported was $24,000,000 but some allowance must be made for higher values in 1912 than in 1903. The decrease in the exports of dairy produce from Canada is not due to a decline in the dairy industry. The total quantity of milk produced annually is increasing every year, but home consumption is growing still faster.

II. Fruit Growing

There are large areas in Canada suitable for the production of fruits of excellent quality. Among tree fruits, the apple, the pear, the peach, the plum and the cherry are extensively grown. Cultivated bush fruits include the raspberry, the strawberry, the gooseberry, the blackberry and the currant. The grape is an important crop in some parts of Ontario. Enormous quantities of wild blueberries are gathered in Northern Ontario and Quebec and in the Maritime provinces, and the semi-cultivated cranberry yields a considerable crop in Nova Scotia.

The Apple.—Its wide distribution, the volume of the annual crop, and its important place in the dietary of the people easily gives the apple first rank among the fruits grown in Canada.

Owing to the diversity of soil and climate, practically every commercially known variety finds some locality where it reaches a high degree of perfection. Ontario, Nova Scotia and British Columbia are the three principal apple producing provinces at present, but in both New Brunswick and Prince Edward Island, where there are large areas of excellent orchard land and a favorable climate, the acreage under trees is growing every year, and the industry has a promising future in those provinces. Apples have been grown in the province of Quebec since very early days and some of the very finest of the fall dessert varieties are produced in large quantities in the vicinity of Montreal.

The apple is the only kind of Canadian-grown fruit which figures

prominently in international trade. The bulk of the export is to Great Britain, but shipments are made to a great many different countries. Some very choice varieties have originated in Canada, of which the Fameuse or Snow and the McIntosh Red are prominent examples. The Fameuse is a native of the Province of Quebec. Its early history is somewhat obscure, but it is generally believed to have been a seedling from fruit introduced by the French colonists in the seventeenth century.

The history of the McIntosh Red apple is authentic and well known. The original tree was found growing as a seedling in 1796 by John McIntosh, the first settler on a farm in Dundas County, Ontario. Pomologists consider it a seedling of the Fameuse. The seed was probably deposited by early travellers from French Canada. The old tree was killed by a fire which destroyed the homestead in 1893. A monument has been erected on the spot where it stood.

Peach growing in Canada is confined chiefly to Southern Ontario and certain valleys in British Columbia. Small quantities are grown in Nova Scotia. The most noted peach growing district comprises the stretch of country bordering the south shore of Lake Ontario from the Niagara River to the western end of the lake, but the counties on the north shore of Lake Erie and the south shore of Lake Huron produce considerable quantities of this luscious and delicate fruit. The Okanagan Valley in British Columbia has recently come into prominence as a peach producing district. During the past two or three years, peaches from the Niagara district have been successfully marketed in Great Britain.

The Pear has a wider distribution than the peach and it is found in all the fruit growing provinces. The most extensive pear orchards are in the lake region of Southern Ontario. Commercially, the pear is of less importance than the peach. A few thousand cases are annually exported to Great Britain.

The Plum flourishes over a very wide area in Canada. Native varieties are extensively grown on the banks of the River St. Lawrence well down towards the Gulf. The Counties of Kamouraska and L'Islet are famous for plums of local origin. British Columbia produces many varieties in great profusion and perfection of quality, especially near the Pacific Coast. The commercial plum orchards are located chiefly in Ontario, Quebec and British Columbia. There are no plums exported.

The Cherry is becoming an important crop with some growers in Ontario and also in British Columbia. The crop is rather uncertain, and the trees are subject to disease unless well cared for, and for these reasons, the cherry does not flourish except under the hands of skilled orchardists.

Bush Fruits of the kinds already mentioned may be grown in any part of Canada. They are naturally grown most extensively in those districts in which the commercial orchards of tree fruits are located. Bush fruits can

be grown between the rows of trees, especially in young orchards, and the organization which a farmer needs to carry on a successful business in growing tree fruits enables him to handle the bush fruits at other seasons of the year to good advantage. It simplifies the labor question to have a succession of fruit crops throughout the summer season. Bush fruits are grown extensively in the gardens on farms and in villages throughout the country. This class of fruit is used more extensively by the housekeeper both in a fresh condition and for canning and preserving purposes than tree fruits are, with the exception of apples.

Grape growing is most successful in the Niagara district and in the extreme western part of the Peninsula of Ontario, by which title that favored country lying between the lower lakes is known. Fruit growers in these sections consider the vine to be one of their most reliable sources of income. Canadian grapes are grown mostly for dessert purposes, only a limited quantity being used for wine making. In the more northern parts of Ontario, the grape is grown to some extent and is carried through the winter by bending the vines down to the ground and covering them with a mulch of straw or some similar material. In these localities, the vine is naturally trained to a different habit of growth than it is in the milder regions where no mulching is required.

Fruit growing appeals to the aesthetic side of life probably to a greater extent than any other branch of farming industry. The intensive cultivation which is possible in fruit growing permits a family to make a living on a comparatively small number of acres of land. This means close settlement and that improves the social conditions surrounding life in country districts. Many a jaded city man has found health, contentment and a fair remuneration in the cultivation of 10 to 25 acres of fruit land. Like any other occupation, it requires close attention to be made successful.

Co-operation in the packing and marketing of fruit and also to some extent in the cultivation, or at least in the purchase of materials and supplies for cultivation, is proving in many localities of great assistance to the fruit grower.

THE LUMBERING INDUSTRY OF CANADA

By H. A. HONEYMAN,

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THIS is one of the most important industries in Canada, and it is likely to continue to hold a pre-eminent place in the business affairs of the country.

Canada is a wooded country. The southern parts of the Province of Manitoba, Saskatchewan and Alberta are, for the most part, treeless. The rest of the Dominion is, or has been, covered with woods. Large forests still remain, though much has been cut away and much has been burned over by forest fires. Lumbering operations are carried on chiefly in British Columbia, Ontario and Quebec, New Brunswick and Nova Scotia, but there is scarcely any part of Canada, with the exception of the prairies, where lumbering is not being done to a greater or less degree. North of these prairie lands large tracts of forest exist where very little work has yet been done. If the early settlements had been made on the prairies, the forests in the east might have been preserved, for, to the first settlers in that part, trees were only things to be got rid of as easily and as quickly as possible, so that grain and vegetables might be grown on the cleared land. So the trees, big and little, were cut down, piled up in heaps and then burned. What else could have been done? But now the older people realize the loss which they were forced to make in order to clear up their farms. Naturally much land was cleared that has since proved to be of little value for farming purposes. The land would be far more valuable bearing a crop of trees than it is now, and as a matter of fact, many such places are allowed to grow up to bush.

The operations connected with the lumbering industry may be treated under two divisions. First, the work in the woods, where the trees are felled, trimmed, cut up into logs, skidded and hauled to the banks of streams. Secondly, the work connected with the transportation of the logs to the saw mills.

The Preparation of the Logs in the Woods

Lumbering is conducted on a large scale in most places, and in a paper of this length many matters of detail must be omitted. It might be well to state that most lumbermen have depots at different points on their limits. Here various buildings are found. A cook-house with a dining room in connection and a sleeping room for the men is a first consideration. Then there may be an office building, a store-house for supplies and stables for the horses. Often there is a farm connected with the depot where hay and grain are raised for the horses and vegetables for the men. These are permanent headquarters, or at least they serve for use for many years.

In the store-house are piled up provisions for the following year's work for man and horse. During this present winter, for instance, provisions will be hauled to the depots to serve for use next year. The men in the bush, as a rule, are well fed. Not only is the quality of the food good, but the variety is much greater than it was in the early days of the industry. If the depot is not convenient to the season's "cut," temporary camps are often made near the place where the men are working. Men are hired in August or September to go to the bush. Some lumbermen, at least, claim that more work can be done in the autumn than in the winter, so they are sending up their men earlier in the season. These men chop down the trees, trim them, cut them into logs, cut the brush and in some cases pile it up. Along with the choppers are men with horses to collect the logs into piles. Other men are making roads for the winter which lead to the bank of some stream. The wages of such men vary from year to year, but there is a general increase. This year the men are getting from $30 to $40 per month with their board.

When snow comes to make a good bottom for sleighing, extra men with teams of horses are secured and sent into the woods. Their work is to haul the logs to the streams and pile them up ready for the opening of the waters in spring. In some camps the work is continued all winter. It depends upon the size of the "cut," the number of the men and teams employed, and also the kind of weather. During the present winter, for example, very little teaming could be done in the early part of the winter. The bogs and lakes were not frozen over and there was very little snow. So the work has been delayed considerably.

In the northern parts of Quebec and Ontario many farmers and their sons make a practice of spending some months each year in the lumber camps. They generally take a team of horses with them, and they are thus able to add considerable to their income. At the same time their farms and stock are more or less neglected. Many of the other shantymen are taken from the saw mills, which are closed in winter.

The Transportation of the Logs

It must be borne in mind that only soft wood logs can be floated down the streams. The specific gravity of hard wood is too great to permit of its being taken down in that way. Hardwood has to be drawn to its destination in the log, or, as often is the case, a portable mill is set up in the woods, the logs are sawed and the lumber is then drawn out to a railway or some other shipping point. In the majority of cases the lumbermen do not cut the hardwood because it is impossible, under present conditions, to get it out of the woods to a railway at a reasonable cost.

As soon as the streams are free of ice, and at that time they are generally swollen with the melting snow and with rains, the logs are rolled into

the streams and the "drive" begins. As many of these streams are small, and in summer would be useless for log-driving, it is important that the logs be got out into the large streams as quickly as possible. Men of skill are needed for this work. The hours are long, and the work is hard and sometimes dangerous. The men try to keep the logs moving, but it is not easy as there are many obstacles along the way. In places the streams are narrow and rocky. Their banks may be low and allow the logs to spread into the woods or fields. "Jams" of logs often occur and some of them are very large. Great skill and hard work are needed to clear the rivers of the big jams. Some of these logs are brought hundreds of miles before they reach their destination at the saw-mills. These mills are often found at the mouths of the rivers, or at water-falls along their course. It sometimes happens that the year's cut of logs cannot be got to the mill during the first summer. The water may be unusually low, or help may be scarce, and as a consequence the logs may have to remain in the river till the next season. To avoid this loss considerable work is being done along the streams to facilitate the passage of the logs. Dams have been built far up the streams, generally at the outlet of a lake, where the surplus waters are held back till needed. The principle of co-operation is largely used by the lumbermen in making improvements along the rivers and in bringing their logs down.

Although transportation by water is the common way of getting the logs to the mill, yet there is at least one exception to this mode in eastern Canada. On the limits of the Fassett Lumber Company in Labelle County, Quebec, the logs are brought to the mill by a specially constructed railroad. This company owns about 68,000 acres of timber land on the Salmon River —twelve miles inland from the mill at Fassett on the Ottawa River. The company has already built, including switches, twenty-five miles of road into their limits. A branch is built into the section where the operations for the year are to be carried on. All the cutting and skidding are here done by jobbers who pile the logs along the railway. These are loaded on cars and taken directly to the mill pond that is kept warm in winter by exhaust steam from the mill.

In the cutting operations, the small stuff as well as the large is cut, and much of the former is used by a chemical company which has a factory at Fassett. There are more than 250 men in their woods this winter and they expect to take out 25,000,000 feet of lumber. This method has proved successful at Fassett, but it would not suit the conditions in most of the large limits in eastern Canada.

The sawing of the logs at the mills is carried on during the summer and late into the autumn. The larger mills are equipped with the most approved machinery of all kinds needed. Many of them, in the busy season at least, run night and day shifts. The lumber yards of a centre like Ottawa cover many acres of land. This is a business in which fortunes have

been made. Many of the lumber kings of Canada today started into the bush with little or nothing more than their axe on their back.

Kinds of Lumber

Spruce now takes the lead as a lumber producing tree. In 1911, 1,600,-054 M. Ft., B. M., were cut in Canada, with a value of $21,842,657, or about $13.65 per thousand at the mill. White pine is a good second with 1,038,542 M. Ft., B. M., with a value of $20,786,147, or $20.01 per M. at the mill. After these in order come the Douglas fir, hemlock, cedar, red pine, birch, tamarack, yellow pine, balsam, maple, basswood, jack pine, elm, ash, poplar, beech, oak, chestnut, hickory, walnut, butternut, cherry, etc.

For the whole of Canada for 1911, there were reported as sawed 4,-918,202 M. Ft., B. M., with a value at the mill of $75,830,954. The total value of lumber, square timber, lath and shingles produced in Canada in 1911 was $83,321,664. The total value of all forest products marketed that year was probably over $150,000,000. Canada is a large producer of wood suitable for pulp-making. In that same year, Canada used in her pulp mills 672,288 cords of wood grown in this country. She exported 847,399 cords in addition to this, making a total production of 1,520,227 cords, valued at $9,678,616. The Province of Quebec takes the lead as a producer of pulp-wood and also in the manufacture of it into pulp and paper.

Limits

A limit may, and generally does, contain many square miles of country. In Eastern Canada each Province controls its timber land, and thus different regulations hold good in different Provinces. A tract of land, or limit, is sold by auction to the highest bidder. As a rule only the timber is sold, and there may be restrictions of various kinds imposed upon the buyer. He may be allowed to cut only certain kinds of trees. He may not cut trees under a certain size. There are regulations in regard to the cutting and piling of brush, and the restrictions in regard to fires are becoming more severe. The time of the lease is also limited, but may be renewed. In addition to the sale price, there is a yearly ground rent which the lumberman has to pay.

Timber is also sold by stumpage, i. e., a price per thousand feet according to the amount cut as measured by the cullers.

Forest Conservation

This matter is closely connected with the lumbering industry. Mr. MacMillan of the Forestry Department of the Dominion Government some time ago made the following statement: "The present lumber cut of Canada is about equal to that of Germany, 4,500,000,000 board feet per year. The annual cut of Germany is regularly taken from an area of 25,-

000,000 acres of forest land and represents the annual growth only. The annual cut in Canada represents the destruction of at least 500,000 acres of the choicest virgin forest that can be found between the Atlantic and the Pacific. Each year it becomes harder to maintain the annual lumber production in Canada, and each year it is becoming easier to maintain it in Germany." Surely this statement contains much food for thought. The various governments in Canada are doing something along the lines of forest preservation, and the lumbermen are in hearty sympathy with the idea. In the western Provinces, the government has wisely set apart considerable areas of land for forest reserves. This is being looked after by officials of the Forestry Department. A great deal of attention is being given to schemes for the prevention of forest fires, and already considerable success has been met with. But this is a subject in itself. As to the future of the lumbering industry, there need be no doubts. It is bound to expand. The demand for lumber is great at present and will increase year by year as the country develops. Canada has great forests, and if the care and wisdom shown by some European nations in the preservation of their forests be applied here, the supply can be easily kept up.

THE CLAY BELT OF NORTHERN ONTARIO AND QUEBEC

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General Features of the Region

IT will be recalled that the northern parts of Quebec and Ontario belong to the great physiographic province known as the Laurentian peneplain,*, or sometimes as the Laurentian plateau. This vast region extends from the lowlands which border the St. Lawrence River and the lower Great Lakes to the Arctic Ocean and is estimated to occupy not less than 2,000,000 square miles in Canada, and a considerable area in the North Central States. Its topography is that of low plateau, now generally recognized as an ancient peneplain, which has been uplifted in comparatively recent times. The drainage is very immature, lakes abound, valleys and watersheds are ill-defined, and it shows the general features of a region beginning a cycle of renewed development.

In northern Ontario and Quebec the region has been heavily glaciated, leaving little, if any soil that is fit for agriculture except in valleys and lake basins. The inhospitable appearance of much of this area has given ground for the unfavorable descriptions that are often written of it, espe-

*"The Laurentian Peneplain," by Dr. A. W. G. Wilson. Transactions of the International Geographical Congress, Washington, 1905.

cially by passing travelers. Being essentially a non-agricultural country, it long remained unoccupied, except by fur traders, lumbermen, prospectors and miners. Yet it is by no means an unproductive region.

Furs and lumber have long been staple products. More than half of the world's supply of nickel is obtained in the Sudbury district and the reserves of this metal are proving almost immeasurable. The greatest silver mining camp in the world has developed at Cobalt within the past ten years, and the production of copper, gold and iron is already important. Valuable developments in the discovery and production of these and other minerals are constantly taking place. Immense water powers are being brought into use every year, and profitable industries are springing up in many parts of what was long regarded as an impenetrable wilderness. One of the most important discoveries of recent years has been the recognition of an agricultural district more than 30,000 square miles in extent, known as the Clay Belt of Northern Ontario and Quebec.

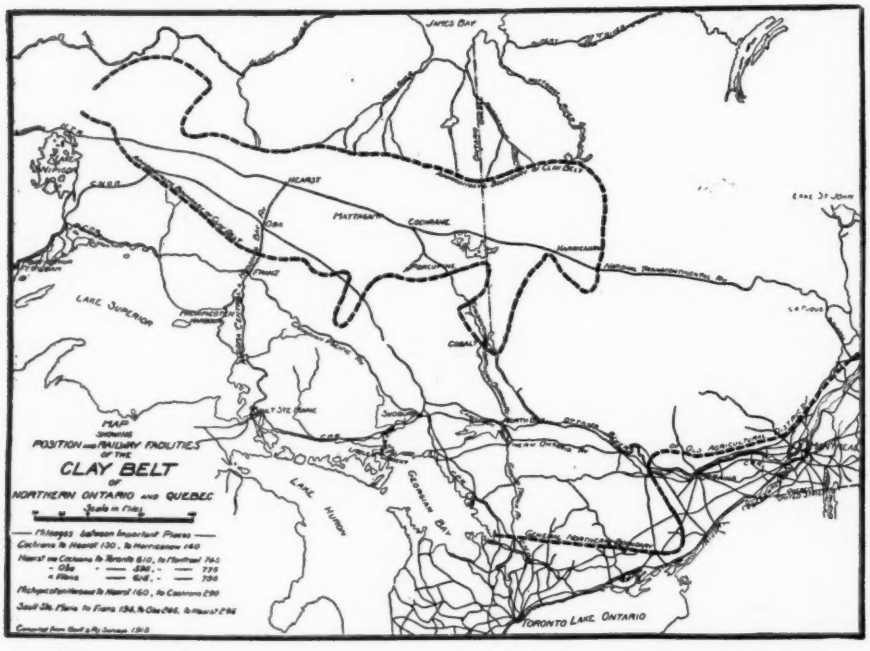
Discovery

As early as 1870, geological and other explorers called attention to land fit for agriculture along the Abitibi River and other routes of travel to James Bay. But it was thirty years later before it was realized that the land between the travelled routes is of the same general character, and that the narrow strips of tillable land to be seen from the water ways are parts of a large, compact area of agricultural land, broken only by lakes, swamps and a few rock hills. It must be remembered that except in winter, when the ground is covered with snow, the only means of travel in this region is by canoe. And although the lakes and rivers are so numerous as to furnish a remarkable number of canoe routes, yet before the advent of the railway most of the travelling was done along a few principal routes. Consequently much of this vast tract is even yet but little known.

However, in 1899 and the years immediately previous, Professor W. A. Parks, Mr. E. M. Burwash, and others called more direct attention to the clay lands in the reports of the Ontario Bureau of Mines, and pointed out their probable large extent and important value. Accordingly, in 1900 as many as ten exploration parties were placed in the field under the direction of Dr. W. G. Miller, Provincial Geologist of Ontario, with the object of tracing out the extent of the agricultural lands of the district. From the results obtained by these and the survey parties of the Deparment of Crown Lands, with whom they worked in conjunction, the approximate boundaries of the Clay Belt in Ontario were first made known. Later investigation by officers of the Geological Survey of Canada, and the Provincial Departments of Mines of Ontario and Quebec have added to the information then gained and have shown partially, at least, the extent of the fertile area in adjacent parts of the Province of Quebec.

Location and Area

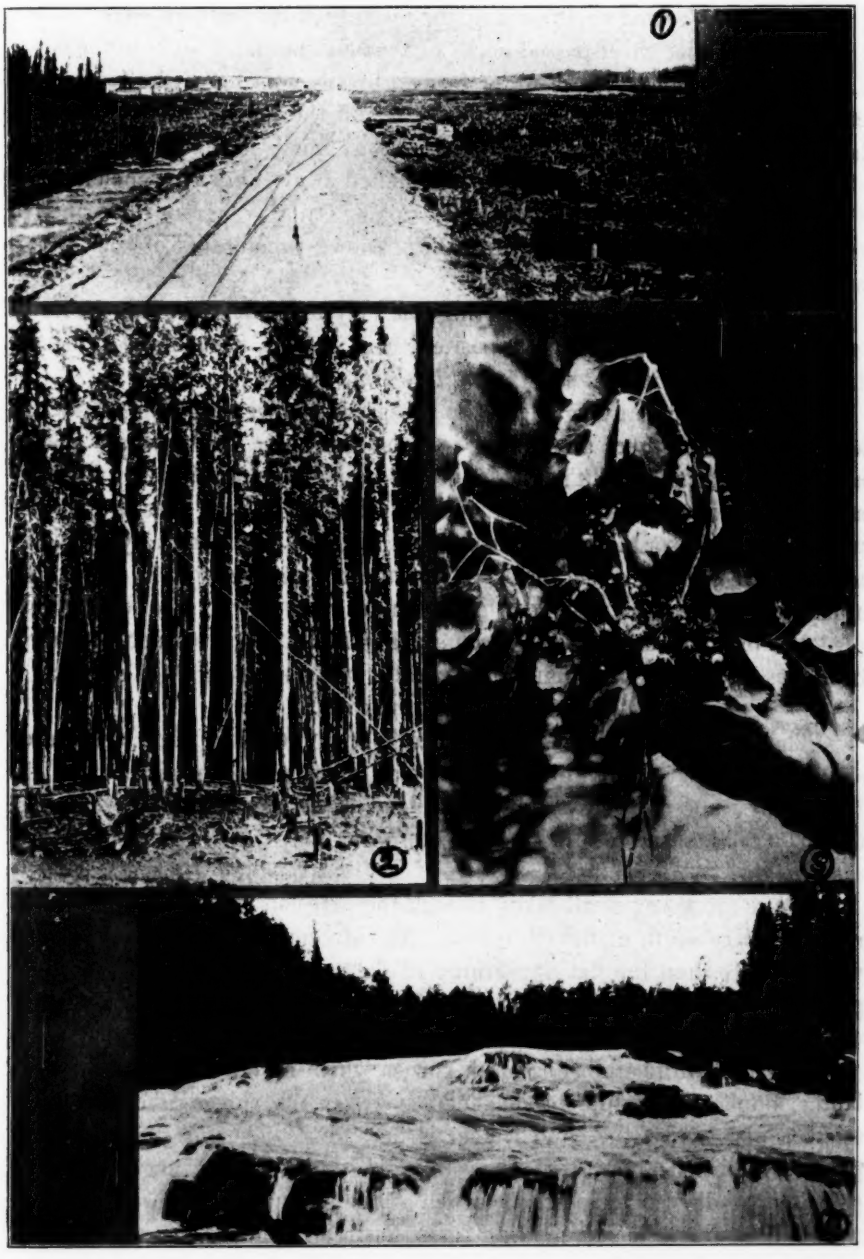
The position and extent of the Clay Belt may be seen by reference to the accompanying sketch may, which has been compiled by Mr. R. R. Rose, of the Lands Department of the Algoma Central & Hudson Bay Railway. The boundaries as shown are necessarily very general. The southern boundary especially is known to be more irregular than the map indicates.



The Clay Belt extends from the vicinity of Lake Nipigon in Ontario to the Nottaway, or Bell River in Quebec, a distance of more than 450 miles. The average breadth is probably a little less than 75 miles. This gives an area of approximately 33,000 square miles or 21,000,000 acres, of which more than two-thirds are in Ontario and the remainder in Quebec. In area it may be compared to the state of Indiana; in latitude and climate to North Dakota and southern Manitoba.

Origin

The origin of the Clay Belt, so far distant from any other fertile area of large size, may be a matter of interest. It has been best presented by Professor A. P. Coleman in the XVIII Annual Report of the Bureau of Mines of Ontario under the title "Lake Ojibway; Last of the Great Glacial Lakes." As Prof. Coleman interestingly shows, the Clay Belt is the bed of a lake, perhaps once as large as Lake Superior, which covered this area in a late stage of the last great Ice Age. An ice sheet which extended southward and westward from the highlands of Labrador covering the region of the



1. Town of Hearst, Looking West along T. C. Ry., June, 1912.
2. Standing Timber, Township of Way, near Hearst.
3. Wild Strawberries and Currants, Township of Franz, July 1912.
4. Thirty-foot Fall, Kabincakagami River, 25 miles from Hearst.

Great Lakes, retreated northward by the melting of its southern edge. When the edge of the ice sheet passed north of the height of land between the Great Lakes and Hudson Bay, the water formed by the melting of the ice became confined between the edge of the ice sheet and the height of land. Thus a lake or series of lakes, was formed which was finally drained when the ice sheet which held it in on the north was melted away. For this ancient lake, Professor Coleman has aptly chosen the name "Ojibway," from the principal tribe of the Indians who are the earliest known inhabitants of the land it once covered.

The water of the lake, assorting the clay and silt from the debris of rock and earth left by the ice, deposited them in beds, thus leveling the surface and covering it by a soil that is free from stones.

On the accompanying map, two lobes are shown projecting from the southern side. Others are known to exist but their positions are not so accurately determined. The valley of the upper Wahnapitie, near Sudbury and another near Jackfish are known to exist. Of those shown upon the map the easterly, or Abitibi-Timiskaming, lobe has been shown by Dr. Coleman to have been an outlet of Lake Ojibway in its earlier stages. The other apparently indicates a deep southwest running bay in the lake which occupied the present valley of the Ground Hog River. It does not appear to have crossed the height of land and probably was not an outlet of the lake.

General Character

The surface of this glacial lake bed is an undulating plain. The even sky line is broken only by an occasional rocky ridge or an abrupt hill formed by some old volcanic intrusion, but these are rarely, if ever, more than 300 feet above the surrounding country and are generally less than half that height.

There are many small lakes, though they are less numerous than in the rocky country south of the Clay Belt. The streams are numerous and flow more rapidly than the flat appearance of the country would lead one to expect. There are occasional rapids, and small falls which might provide water power of local importance.

The prevailing timber is black spruce which covers much of the lower land. Poplar and white birch generally cover the ridges, and where the soil becomes sandy, the chief timber is jack pine. The forest is broken in places by burned areas, and by swamps, in which the drainage is not yet sufficient to allow trees to grow. Much of the swamp land, however, will be reclaimable when the surrounding forest has been removed.

The soil is mainly stratified clay loam often overlain by a few inches of black earth, largely of organic origin. The clay is frequently in beds of two or three inches in thickness, separated by layers of fine sand or silt less than one-fourth of an inch deep. Locally there are areas of boulder clay, but the soil is generally free from stones.

Various kinds of grain and root crops have been raised at different Hudson's Bay trading posts in the district for many years. Very promising farms have been opened along the Timiskaming & Northern Ontario Railway. Mixed farming has been very successfully carried on around the northern end of Lake Timiskaming for the past 15 or 20 years, and on a larger scale with wheat raising and dairying in the Lake St. John district shown at the eastern edge of the map for a still longer time. In this district there is a population of about 60,000 people, occupied in farming and lumbering. Accordingly the general suitability of the Clay Belt for farming purposes may be considered as well established.

Railway Development

Four railways give access to this region. The National Transcontinental Railway traverses it from east to west and the Canadian Northern parallels the Transcontinental through the western half at a general distance of 50 miles to the south. Both of these roads are parts of transcontinental systems.

The Timiskaming and Northern Ontario enters the Clay Belt from the south, near the boundary between Ontario and Quebec and joins the Transcontinental railway at Cochrane connecting it with Toronto and "old" Ontario and Quebec. This was the first of the four railways to penetrate the fertile region, and is the only one yet actually completed, although a large portion of the others is already in commission.

The fourth railway, the Algoma Central & Hudson Bay, extends from Sault Ste. Marie to the Transcontinental at the town of Hearst, with several branches to mining camps, and one to Michipicoten Harbor on Lake Superior. The Algoma Central & Hudson Bay crosses the Canadian Pacific Railway at Franz. The latter line runs nearly parallel to the southern limit of the Clay Belt and at short distance from it for 200 miles but does not enter this fertile area.

Commercial Prospects

This large fertile tract being entered almost simultaneously by four lines of railway offers an interesting study as to its commercial development. Its staple products will be farm products and pulp wood, with an occasional development of valuable minerals as has taken place at Porcupine. Will trade develop with east and west or with the south? If to the south, will it follow the all rail routes to "old" Ontario and Quebec or take the shortest route to ports on the Great Lakes by way of Michipicoten Harbor?

The eastern end of the Clay Belt is scarcely 350 miles from Quebec City along the line of the Transcontinental railway. The western end, which is not very well known, is about 450 miles from Winnipeg. Distances between other important points are shown on the map. A forecast of the commercial development of the Clay Belt would furnish an interesting and suitable question for discussion by readers in the columns of the *Journal*.

GEOGRAPHICAL INFLUENCE IN THE LOCATION OF LEADING CANADIAN CITIES

By ISABEL G. BRITTAIN,

High School for Girls, Montreal

A GREAT deal of interesting information may be gained by tracing in detail the history of the development of one or two of Canada's largest cities.

Halifax

The City of Halifax, one of the chief naval stations in North America, is the largest city and the capital of the Province of Nova Scotia and owes its origin—which is military—to its splendid position on rising ground on one of the best harbors in the world. It is situated on a protected embayment of the coast line on the west side of the bay of the same name. The bay is the outlet of two cross valleys of the province.

The province itself is divided into two parts by a ridge running the length of it; part slopes towards the Atlantic and the other half towards the Bay of Fundy. The latter part, which slopes away from the ocean, is most fertile, the higher portion being well stocked with woods and the lower a very fertile land. This inner coast line contains few harbors of importance but the rugged nature of the southern coast which has been partly depressed beneath the sea supplies excellent harbors along this shore, that of Halifax being the best. It is one of the chief British naval stations in America and is strongly fortified. The harbor is open all the year round, and is fourteen miles long and fully 40 feet deep in every part. The military fortifications, which formed the nucleus of Halifax, were placed on the rising ground to the west of this wonderful natural harbor.

Montreal

Montreal, situated on the south shore of an island of the same name just below the junction of the Ottawa River with the St. Lawrence, is the largest city and the commercial metropolis of Canada. The island upon which it is situated is fertile and the surrounding country is a rich farming district which contributes largely to the needs of a growing city.

Let us examine rather minutely the exact location of this city, because that has contributed largely to its position of importance in the country. First of all, it is situated at the head of navigation, on one of the greatest commercial highways of the world, a river which from source to mouth measures about 2,200 miles and drains a basin of 530,000 square miles. At the island the river is about 2 miles wide. Opposite the island and a little above the city on the south shore of the river is the town of Lapraine, near which a stream enters the St. Lawrence and which by a portage was con-

nected to the Richelieu River. This was no doubt an old canoe route and is the shortest natural road to New York; by following this route the journey by Sorel is cut off and the distance considerably shortened. The little river St. Pierre on the island flows into the St. Lawrence River just above the city, and a ditch which connected this river with Lake St. Louis constituted the first canal in Canada and took the place of the Lachine Canal built from Montreal to Lachine across a part of the island to overcome the Lachine Rapids, which are in the river just above the city of Montreal. The canal is 8½ miles long and has a rise of 45 feet; it connects the river at Montreal to Lake St. Louis, an expansion of the river opposite the western end of the island. Into this lake come the waters from the Ottawa and St. Lawrence rivers, and while the St. Lawrence is now the highway for trade to the west, the Ottawa was the old canoe route to Hudson Bay and to Georgian Bay and the west. This latter was the path taken by the old fur traders, and was followed by Champlain in 1615 when he went to visit the Huron Indians on the shore of Georgian Bay. When this route is reopened by the use of the Ottawa River, Lake Nipissing and the French River and the building of canals, much of the grain trade from the west will be deflected from its present course and will come down the Ottawa to Montreal.

The Trent Valley Canal now in course of construction and connecting the Georgian Bay to the Bay of Quinte will save the passage through Lakes Erie and Ontario and bring a large supply of grain which now goes through the Erie Canal down to Montreal and will considerably shorten the distance to Europe, if this route is taken in preference to that through the Erie Canal.

Montreal has one of the finest harbor fronts in the world. It is 32 miles long and has a 52,000-ton floating drydock capable of accommodating vessels of largest tonnage coming to this port and necessitating the employment of 500 men. The city has direct steamship communication with European ports and with the Great Lakes and is the chief port for Canadian exports and imports. The water power from the Lachine Rapids just above the city gives it abundant opportunity to develop manufactures which are already numerous. It is also the headquarters of all the great Canadian railways. Part of the city is situated on the site of the little Indian village of Hochelaga, discovered here by Cartier on his voyage to Canada in 1535.

Toronto

The Great Lakes furnish opportunity for cities and one at least must be mentioned, Toronto, the capital of Ontario, and one of the largest and most important cities in the Dominion, is situated on the northwest shore of Lake Ontario and has an excellent natural harbor of a very different type from that of Halifax. It has as a break-water a series of islands,

which make an excellent land-locked harbor. The city is situated at the point where the Don River enters Lake Ontario and was connected by a portage with Lake Simcoe and so with Georgian Bay and the west, another old fur-trading route.

As one studies the history of the origin of these different cities and towns in the Dominion one cannot help being struck with the wonderful perspicacity displayed by the early fur traders and *coureurs de bois*. It seemed as if they almost realized the possibilities of the country and they seem to have displayed great breadth and sagacity in the routes which they followed and the stations which they established.

Toronto's proximity to the coal fields of the United States is important for its manufacturing industries which are extensive. Coal is brought to Toronto very directly and easily from Buffalo or Fort Erie without transshipment. It is a distributing centre for Ontario and carries on a great trade with the west.

The agricultural implements manufactured in Toronto are most widely used and it has first class railway and steamboat connection. The first of the latter was built from Toronto in 1853.

Winnipeg

Winnipeg, the capital of the province of Manitoba and the central city of the Dominion, is to-day a city of 135,000 inhabitants. In 1870 its population was 100 with 28 buildings; in 1880 it was 6500; in 1895 it numbered 30,000; this latter was owing no doubt to the tremendous impetus given to the colonization of the country by the opening up of the Canadian Pacific Railway.

Lord Selkirk may be said to be the founder of the Province of Manitoba as far back as the beginning of the 19th century, when he purchased a controlling interest in the Hudson Bay Co., and obtained a large grant of land on condition that he would establish a colony. He settled the first ship load of immigrants that he brought out near the junction of the Red and Assiniboine rivers. At that time a great strife was being waged between the northwest and the Hudson Bay Companies for the possession of the land and the monopoly of the fur trade. The former company was merged in the Hudson Bay Co. and Fort Garry, now Winnipeg, became the headquarters of the company. What more natural than that this accessible spot should be chosen on which to build a fort to protect them from the frequent attacks of the Indians and as a store-house for provisions and a place of exchange for the furs? All these articles had to be transported in canoes and Fort Garry was near the junction of the Red and Assiniboine rivers. It is situated on a treeless plain in the heart of Canada on the line of the natural routes of the great railways, and at the entrance to the prairie section. Many miles

of lake and river surround it and make it a point of contact with the plain to the west, the great plain on the south and on the north, the Hudson Bay on the northeast and the Great Lakes on the east. This well-watered plain on which Winnipeg is situated is said by geologists to have been at one time during the close of the glacial period a great inland sea, now named Lake Agassiz. As it dried up it left behind a black alluvium of the richest quality which is most suitable for the growth of wheat; this soil and the climate with high dry temperature and much sunshine and short nights cause the crops to mature quickly and so Manitoba and the northwest are among the best wheat producing areas in the world.

With the completion of the Canadian Pacific Railway, which has its inland workshops here, the usefulness of the city of Winnipeg as a receiving and distributing depot for Manitoba and the northwest was more fully realized, and it advanced by leaps and bounds until the fort became a thing of the past. Fort Garry dates from 1812; the city of Winnipeg was incorporated in 1874.

The Canadian Pacific Railway, Great Northern, Canadian Northern, and Grand Trunk Pacific, are railways which radiate from the city in all directions, and of these the Canadian Pacific Railway by its steamship lines connects Winnipeg to Japan on the west and Great Britain on the east.

Vancouver

Previous to 1885 the site of the city of Vancouver was a primeval forest thickly covered with gigantic trees. When the Canadian Pacific Railway was prospected this place was chosen as it terminus and the choice was amply justified by the possibilities of the position and by their fulfillment. The city was founded in 1885 on Burrard Inlet, an arm of the sea off the Strait of Georgia which provides a deep and land-locked harbor. This is one of the natural harbors spoken of previously and is formed by the embayment of the coast. As well as being the western terminus of the Canadian Pacific Railway it is the terminus of steamships to Japan and China, Australia, Hawaii, New Zealand, and Alaska, and is a city of great commercial importance.

Besides its importance as a distributing center for the traffic from eastern Canada and the continents on the other side of the Pacific, Vancouver is annually becoming more noted as a manufacturing center. Its lumber and saw mills are large and up-to-date. The population is 100,000.

Other Cities

There are many other typical cities in Canada which might and ought to be mentioned. Edmonton has an excellent position, commanding the valley of two great river systems, the Mackenzie and the Saskatchewan, and it is on the high-road of travel to the west, the Canadian Pacific, Grand Trunk Pacific, and Canadian Northern passing through it on their way to

the coast. It has fairly lately been chosen as the capital of Alberta, and is a university town; its progress will no doubt be by leaps and bounds.

Several mining towns might have been mentioned and Fort William and Port Arthur, where the western grain is shipped on Lake Superior and many others. Lastly, the rise of Prince Rupert, which is to be the western terminus of the Grand Trunk Pacific, and of Fort Nelson on Hudson Bay, will be watched with interest. The latter place will be connected with Liverpool by a steamship line.

CANADIAN COMMERCE

By WILLIAM F. GREEN,

Toronto, Canada

THE commercial relations of Canada are like the country itself, in the early stages of development. The opening up and settling of the country naturally increases the commerce, and the commercial relations have been gradually extended until at present, nearly all foreign countries are included.

The growth may be seen by making a comparison of the present with the last two decades. In 1891 the total exports and imports were 85 million dollars. In 1901, with a population of 5 million, the trade amounted to 386 million dollars, being $72 per capita. In 1911, with a population of 7 million, the amount of trade was 769 million dollars, being $107 per head. There is then in the last decade, an increase to nearly twice the volume, or an increase of 32 per cent per capita.

In comparing the exports with the imports at the beginning and the end of the last decade, we see there is a difference in the relation. In 1901 the imports were 190 million, while the exports were 196 million dollars. In 1911, however, the exports were 297 million while the imports had reached 472 million dollars. This large increase of the imports over the exports indicates, that with the rapid development the demands are greater than the production.

A more detailed examination of the figures will give an idea along what lines the production is greater than the demand, and also to what branches the large increase in imports is due. A table is given indicating the principal divisions and their amounts in round numbers.

	Exports	Imports
Agriculture, including animals	134 million	58 million
Fisheries	15 million	2 million
Forest	45 million	12 million
Manufactures	35 million	310 million
Mineral	42 million	44 million

The figures indicate the excess of the supply over demand is mainly in agriculture, fisheries, and forest, while the great excess of imports over exports is due almost entirely to manufactures. In the case of mines they are about equal. The one factor that brings the imports so high in this case is the lack of coal. A table giving the chief exports and imports in more detail is shown below:

Agriculture	Exports	Imports
Grain	49 millions	7 millions
Animals (including meats)	18 millions	4 millions
Cheese	20 millions	
Flour	2 millions	
Fruits	2 millions	
Fisheries.		
Salmon, Cod, and Lobsters	12 millions	
Forests.		
Lumber	36 millions	10 millions
Pulp	6 millions	
Minerals.		
Asbestos	2 millions	
Coal	6 millions	30 millions
Gold, Silver, Copper, and Nickel	31 millions (coin and bullion)	10 millions
Manufactures.		
Agricultural implements	5 millions	
Drugs and chemicals	1 million	12 millions
Iron and steel	2 millions	86 millions
Leather	2 millions	5 millions
Paper	3 millions	5 millions
Cotton and cotton goods		31 millions
Wool		24 millions
Sugar and syrups		15 millions
Glass		3 millions
Tinware		4 millions

These statistics indicate the possibility of supporting a larger manufacturing population, and also the establishment of manufacture, since raw materials, power facilities, and a good market are close at hand.

In examining the trade with the different countries, by far the greatest amount is confined to two countries, Great Britain, and United States. The exports to Great Britain in 1911 were 136 million, and to the United States 119 million dollars, while the imports were 110 million and 294 million dollars respectively. This larger trade with the United States is in spite of a differential tariff in favor of Britain, thus showing that the dis-

the coast. It has fairly lately been chosen as the capital of Alberta, and is a university town; its progress will no doubt be by leaps and bounds.

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patch with which materials may be obtained nearer home more than counterbalances the difference in tariff.

For the collection and the distribution of the different commodities the facilities are increasing. At present the Great Lakes with their connecting rivers and canals form a waterway which materially cheapens the cost of transportation from the west to the east. In addition, three transcontinental railways are built or are under way. The Canadian Pacific already completed, the Grand Trunk Pacific under construction, the Canadian Northern partly constructed and with extension to both seaboards in view, are the three main systems. If, as seems possible, at the completion of these railways the time of transportation via Suez from Australia and New Zealand to their market in Britain, is materially reduced via America, Canada may become a highway of commerce, and her trade with the east be greatly increased.

THE MINERAL INDUSTRIES OF CANADA

By H. C. COOKE,

Geological Survey, Ottawa

THE mineral production of Canada is small compared with that of the United States, Britain, Germany, and other great producers of minerals. Large areas of the wilder parts of the country whose geology is such as to indicate the probability of the occurrence in them of valuable deposits, remain unprospected and even almost unexplored; hence it is probable that discoveries will continue to be made as exploration proceeds for a long time in the future. The search for minerals is now being vigorously prosecuted; the hardy prospector is every summer pushing farther back into the wilds, through northern Ontario and Quebec, even into Labrador on the east side of Hudson's Bay, and on the west side into the country as far west as Great Bear Lake. Prospecting in British Columbia and western Alberta is equally vigorous. As a result, almost every summer of recent years has seen the discovery and opening up of a new mining district, and the wider exploration of the older ones. The effects of this exploration are seen more clearly on turning to the reports of mineral production for the past few years; the total mineral production of Canada for 1904 amounted only to about sixty millions of dollars, while that of 1912 was over one hundred and thirty-three millions, an increase in eight years of more than 120 per cent.

In the importance of its mineral production Ontario takes precedence over the other provinces. This position is mainly due to the great quantities of silver now being taken from the rich Cobalt field, and to the nickel deposits of almost equal value in the district around Sudbury. The manu-

facture of cement and clay products is also an industry of much importance in Ontario, a fact to be expected when it is considered that the population of this province is the largest of the Dominion. Altogether, the mineral production of Ontario is over 38 per cent of that of Canada. British Columbia stands next, with about twenty-two per cent. Its products, in order of importance, are coal, gold, copper, and silver. Nova Scotia holds third place, with about fifteen per cent of the total Canadian production, and its position is due almost entirely to the amount of coal it mines. The position of fifth rank is held by Quebec; here asbestos is the chief product, with cement and clay products second. The coal mined in Alberta is of sufficient importance to make the mineral production of the province about nine per cent of the total.

As regards the production of individual minerals, coal leads, then follow in order structural materials, silver, nickel, copper, gold, asbestos, and natural gas. The coal mined in 1912 amounted to over fourteen million tons, valued at about thirty-six million dollars. The major part of the coal, about fifty per cent, comes from Nova Scotia; twenty-six per cent was produced by British Columbia, and twenty-two per cent by Alberta. (These percentages are those of 1910, since the figures for 1912 are not yet available. The coal of the Dominion is all of bituminous grade, with the exception of about a hundred thousand tons of anthracite produced yearly from a single mine in Alberta and of a few hundred thousand tons of lignite mined in Alberta and Saskatchewan. The production of coal in Canada amounts only to about one-half of the total consumption, due to the fact that the principal fields are located on the extreme east and in the far west, while the central provinces, which contain the great bulk of the population, are without coal deposits. Nova Scotia coal is largely consumed within the province and also finds a considerable market in Quebec. The market in Ontario is almost altogether supplied, and those of Quebec and Manitoba to a lesser degree, by coal imported from the nearer fields of the adjacent states of the United States. British Columbia exports a large proportion of its coal, nearly fifty per cent in 1910, mainly to the states along the coast to the south.

Silver.—Canada now stands third among the silver-producing countries of the world, Mexico and the United States being the only larger producers. This position is solely due to the exploitation of the rich silver ores of the Cobalt district of northern Ontario. The district takes its name from the fact that the commonest and most conspicuous ores of the district are those of the metal cobalt, whose pink color on weathered surfaces, "cobalt bloom," holds out to the prospector a promise, not always fulfilled, of the presence of the sought-for silver. The silver in the ores is present mainly in the

metallic form, in all shapes and sizes, from the thinnest leaf or the finest wire filigree to nuggets of irregular size and heavy slabs up to an inch, or occasionally even several inches in thickness. These ores yield about ninety-two per cent of the silver mined in the Dominion, and reached a value of over seventeen millions of dollars in 1912. Almost all of the remaining eight per cent is produced from the silver-lead ores of British Columbia.

Nickel.—Canada mines over fifty per cent of the world's supply of nickel, and almost all of the remainder comes from the French colony of New Caledonia. All the Canadian nickel is taken from the nickel-copper deposits at Sudbury, Ontario, whose ores are now yielding about thirteen millions of dollars worth of nickel annually. The greatest value of nickel lies in its use as an alloy for steel; it gives to the steel very great hardness, strength, and elasticity, and high resistence to abrasion, or to corrosion by salt, fresh, or acid waters or by superheated steam. On account of these properties it is used for making armor plate for battleships, gun shields, turrets, etc.; for steel rails in sharp curves, where wear is great; for wire cables, marine apparatus, and many other articles in which these qualities are required.

Gold.—The production of gold in Canada is only about a tenth of that in the United States; it amounts to about twelve millions of dollars. Of this over five million is produced by British Columbia, and somewhat more by the Yukon. Most of the Yukon gold is mined from placer deposits, while that of British Columbia is mainly lode gold. The new Porcupine camp of northern Ontario produced over $1,750,000 in gold in 1912.

Copper.—The value of the copper mined in 1912 was nearly thirteen millions of dollars. About two-thirds of this output comes from southern British Columbia, practically all of the remainder from the nickel-copper deposits at Sudbury, Ontario.

Asbestos.—About three million dollars worth of asbestos was produced in 1912, and the amount is rapidly increasing. This represents about ninety per cent of the total production of the world. All of it is obtained in one locality, around Thetford and Black Lake, in the eastern townships of Quebec. The asbestos is of the variety known as chrysotile asbestos, extremely valuable because of the fine, soft, and silky nature of the fibre, which permits it to be woven into cloth, rope, etc. The fibre rarely exceeds two inches in length. The asbestos is obtained by crushing and screening the rock which contains it, and then separating the fibres from the rock by the use of air currents. Asbestos is used for a great variety of purposes in the manufacture of articles which require to be of fireproof material. The poorer varieties are employed for making fireproof paints, boiler coverings, packing in fire safes, etc. Of the better varieties are manufactured fireproof rope, felt, tubes, cloth, boards, and other objects.

CANADIAN RAILWAY DEVELOPMENT

By JOHN J. O'NEILL,

Geological Survey, Ottawa

THE factor of greatest importance in the opening up of a new country is its railways. Canada is pre-eminently the new country of the twentieth century, and it is interesting to see in just what way the railways are furthering the tremendous development of the industries, and the colonization of unsettled territory.

The striking feature of the great railway expansion is the part played by the Government in stimulating company enterprise, and in building government railroads where private companies do not feel justified in taking the risk. Up to the end of June, 1911, the Dominion Government had expended for the construction of Government railways a total of $261,414,695 and had granted subsidies to private railways amounting to $148,217,072, and land grants along their right-of-ways totalling 32,004,474 acres. The subsidies granted by the separate provinces up to the same date totalled $35,-919,360, with land grants of 32,251,943 acres, making a grand total of governmental aid to private companies of over $184,000,000 and 55,256,417 acres of land.

The five great railways in Canada are:

(1) The Canadian Pacific Railway.
(2) The Grand Trunk Railway.
(3) The Grand Trunk Pacific Railway.
(4) The Canadian Northern Railway.
(5) The Intercolonial Railway.

The first and third of these are transcontinental lines, and number 4 may almost be considered such. The Intercolonial and the eastern division of the Grand Trunk Pacific are the property of the Dominion Government; the others are owned by private companies. The Canadian Pacific Railway has the unique distinction of being the longest single railroad on the American continent; in 1911 its length was over 10,200 miles, and it forms a continuous Canadian system from the Atlantic to the Pacific. Not only does this railway dominate land traffic but it maintains fleets of steamers on the Great Lakes and on both oceans, plying between Montreal and Liverpool, and between Vancouver and Tokio, Japan. It maintains its own hotels, one of which is to be found in every large city and in numerous resorts en route.

The Grand Trunk system in Canada operated 3,095 miles of railroad in 1911. This railway is not purely Canadian but has a large part of its system in the United States; its eastern terminus is Portland, Maine, and it extends west to Chicago. It does not maintain a system of hotels but has just opened one valued at $2,000,000 in Ottawa.

In 1903 this company made an agreement with the Federal Government by which it undertook to build the western division of the Grand Trunk Pacific; and upon completion of the road the company will lease the eastern division and operate the whole system.

The Canadian Northern is one of the most active railways in the country; in 1911 there were 3,688 miles of railroad in operation, and it is rapidly connecting separate stretches of road so that in the near future this railroad also will be transcontinental. It is constantly extending its lines, and one of the big feats in construction at present is the driving of a tunnel through Mount Royal, at Montreal, to afford an entry to the heart of the city from the north.

The Intercolonial Railway is owned and operated by the Dominion Government. It extends from Halifax, Nova Scotia, to Montreal, Quebec, and is over 1,450 miles in length. It was built in fulfillment of one of the clauses of the Confederation of the Provinces.

The Grand Trunk Pacific Railway is treated last because it is the newest, and is being built under peculiar conditions. In 1903 the Dominion Government entered into an agreement with the Grand Trunk Railway by which a transcontinental railway was to be built wholly on Canadian territory. The essentials of this contract were that the Government should construct the eastern section of the road, i. e., that part from Moncton, New Brunswick, on the Atlantic coast, west to Winnipeg, Manitoba, and that the Grand Trunk Railway should build at its own expense the western section extending from Winnipeg to Port Simpson or Prince Rupert on the Pacific coast. The road was to be completed in 1913. The length of the eastern division is 1,805 miles, and over 68.5 per cent of the whole work was completed by June 30, 1911; the total expenditure up to this date was $95,423,085. The western division is divided into two sections, a prairie section and a mountain section. It has a total length of 1,750 miles and traverses the most fertile belt of the western prairie provinces and of British Columbia, thus opening up for settlement a vast area of the finest wheat land in the world. A large part of both divisions is already under operation, and the whole line will be finished within a year or two. This system is already operating a line of steamships in the Pacific coastal trade.

The Government is going ahead with a new railway, the Hudson Bay Railway, which will extend from Winnipeg to some port on the west side of Hudson Bay, and from Montreal to a port on the east side of the same bay, thus opening up a great stretch of new territory, and providing another outlet for the great wheat crops of the West.

A comparison of statistics by decades will give a fair idea of the rate at which the railways are reaching out for new territory.

From 1891 to 1901 the number of miles of steam railway in operation

was increased from 13,838 to 18,140 miles; in the succeeding decade this total increased to 25,400 miles.

The average increase from 1891 to 1901 was at the rate of 430 miles per year, and in the succeeding decade, 1901 to 1911, the average rate of increase was 726 miles per year, which is a 70 per cent gain over the rate of the preceding decade.

Not only are the great railway systems building up and extending their main lines, but numerous branch divisions are in course of location or construction, and within a comparatively few years by far the greater part of this vast Dominion will be easily accessible.

CANADA'S FISHERIES*

By WILLIAM L. UGLOW,

Kingston, Canada

TO say that Canada possesses the most extensive fisheries in the world is indeed no exaggeration; moreover, it is safe to add that the waters in and around Canada contain the principal commercial food fishes in greater abundance than the waters of any other part of the world. The extraordinary fertility of what may be called Canadian waters is abundantly proved by the fact that, apart from salmon, all the lobsters, herring, mackerel, and sardines, nearly all of the haddock, and many of the cod, hake, and pollock landed in Canada are taken from within her own territorial waters.

Chief Fishing Grounds

These fall naturally into three classes: the Atlantic coast, the Pacific coast, and the fresh water inland lakes.

The coast line of the Atlantic provinces extends from the Bay of Fundy, near the United States boundary, to the Straits of Belle Isle, between Labrador and Newfoundland. The contour of the shore is anything but regular, and is a complex series of bays and indentations, which form innumerable natural harbors and coves, in which a great number of valuable fish are taken with little effort. The extent of the shore line without considering the minor irregularities is about 5,000 miles.

The Pacific coast fishing grounds, although not so extensive linearly as those of the Atlantic, have a sea-washed shore of about 7,000 miles. This is due to the immense number of bays, fiords and islands, which characterize

*Material for this article has been obtained from the 45th Ann. Rpt. of the Dept. of Marine and Fisheries, Canada, 1912.

the rugged sea coast of British Columbia. Fish and mammals are exceedingly abundant in this part of Canada's waters.

In addition to the salt water fishing grounds, Canada is well supplied with inland waters. In area, these are estimated to occupy no less than 220,000 square miles. A concrete notion of the extent of these fresh-water bodies may be gained, when it is remembered that the Canadian waters of the Great Lakes form only about one-fifth of the total area of the fresh-water lakes of the country.

Kinds and Methods of Fishing

The fisheries industry consists of three chief types: the deep sea, the inshore or coastal, and the inland lake fisheries.

The deep-sea fishery is pursued mainly along the Atlantic coast, on the several so-called banks, which lie from 20 to 90 miles off the coast. The fishing boats are vessels of from 40 to 100 tons burden, carrying crews of from 12 to 20 men. The style of fishing is that of trawling by hook and line. The bait used is chiefly herring, squid, and capelin; and the fish taken are principally cod, haddock, hake, pollock, and halibut.

The inshore or coastal fishery is carried on in small boats with crews of from two to three men; also in a class of small vessels with crews of from four to seven men. The means of capture employed by boat fishermen are gill nets, hooks and lines; and from the shore are operated trap-nets, haul-seines, and weirs. The commercial food fishes taken inshore are the cod, hake, haddock, pollock, halibut, herring, mackerel, alewife, shad, smelt, flounder and sardine. The most extensive lobster fishery known is carried on along the whole of the eastern shore of Canada, while excellent oyster beds exist in many parts of the Gulf of St. Lawrence: notably on the north coast of Prince Edward Island, and in the Northumberland Straits.

The salmon fishery is, of course, the predominant one on the Pacific coast; but a very extensive halibut fishery is carried on in the northern waters of British Columbia, in large, well-equipped steamers and vessels. The method of capture is by trawl-lining, dories being used for setting and hauling the lines, as in the Atlantic deep-sea fishery. Herring are in very great abundance on the Pacific coast, and provide a plentiful supply of bait for the halibut fishery.

In the inland lake fisheries, the various means of capture in use are gill-nets, pound-nets, seines, and hook-and-line to a great extent. The principal commercial fishes caught are whitefish, trout, pickerel, pike, sturgeon, and fresh-water herring—the latter in the Great Lakes of Ontario only.

Another industry closely related to fisheries is pelagic sealing. Until recently, this had been carried on so extensively in the waters of the North Pacific Ocean, that apprehension for the future of the industry, caused by the possible extermination of the seals, induced the governments of Great

Britain, Japan, United States and Russia to meet in concert through their representatives, and formulate an international agreement in restriction of pelagic sealing. As a consequence, it was decided to prohibit sealing for a period of fifteen years, beginning 1911, in the North Pacific Ocean, north of the thirtieth parallel of north latitude, and including the seas of Bering, Kamchatka, Okhotsk and Japan. The provisions of this convention were not to apply to Indians, Ainos, Aleuts or other aborigines, dwelling on the coast of the waters mentioned, provided such aborgines were not in the employment of other persons, or under contract to deliver the skins to any person.

The Annual Catch and its Value

The total marketed value of all kinds of fish, fish products, and marine animals taken by Canadian fishermen in both the sea and inland fisheries during the year ending March 31, 1912, amounted to $34,667,872. The sea fisheries accounted for about 90 per cent of this total.

The following table shows the catch of the chief kinds landed in the whole of Canada for 1911-1912:

	Hundredweight		Hundredweight
Salmon ..... Cut..	1,136,732	Mackerel	90,141
Lobsters	589,141	Pickerel	80,328
Cod	2,097,260	Pike	80,328
Herring	2,251,278	Hake and Cusk.....	275,755
Halibut	245,609	Clams and Quahaugs, bbls..	103,347
Haddock	530,221	Pollock	250,881
Sardines ..... bbls..	404,383	Oysters ..... bbls..	31,746
Whitefish	131,515	Alewives	75,567
Trout	80,638	Sturgeon	9,145
Smelts ..... Cut..	81,748		

The above list is arranged in the order of the values of the catch, the salmon catch amounting to ten and one-third million dollars.

RESOURCES AND DEVELOPMENT OF BRITISH COLUMBIA.

By JOHN A. ALLAN,

University of Alberta, Edmonton

THERE is no province in Canada which has such a vast wealth of undeveloped resources as British Columbia. Its riches consist in mineral wealth, which has produced in the last twenty years about $369,000,000; and in its productive agricultural and fruit-farming land, much of which is yet in an undeveloped state. One of its leading resources is its forests, the products of which are increasing rapidly each year. During 1911 this

resource amounted to almost twenty-five million dollars. The fisheries may be considered one of the unlimited natural resources. Climate, geographical position and physiographical features may also be regarded as equally advantageous and valuable in the development of this Pacific Province.

British Columbia is the western and very mountainous province of Canada. Its eastern boundary north from the 49th parallel is defined by the watershed of the backbone of the North American continent, known as the Rocky Mountain system. At the intersection of the continental divide with 120° west it follows this meridian to 60° N., which forms its northern boundary. More generally speaking it may be said that British Columbia includes much of the mountainous region included in the North American Cordillera from the fertile grain and grazing lands of the Great Plains west to the Pacific Ocean.

After the discovery of British Columbia by Perez, a Spaniard, in 1774, followed by coast exploration by Capt. Vancouver in 1792, and by Mackenzie and traders of the Hudson's Bay Company who explored a part of the interior of this Cordillera about the same time, little was known about this part of the continent until near the middle of the 20th century. Vancouver Island was made a British Colony in 1849, and the mainland incorporated as a colony in 1858. The development of the province has progressed not uniformly since that time but rather spasmodically.

A very rapid development of this part of the Dominion occurred after the completion of the Canadian Pacific railway, the first transcontinental railway. The last spike of this road was driven on November 7th, 1886, near the central part of the province. This railway brought the Pacific Coast in easier communication with the east and especially with the Great Plains which were destined to become one day the most productive part of the Dominion, agriculturally. It induced steamship transportation and tapped several thousand square miles of the wilderness of the Cordillera, including virgin mineral and forest lands.

Population

The province has an area of about 222,747,200 acres or 357,480 square miles, of which about 300,000 square miles are still in an unprospected and almost unexplored condition. The census for 1911 shows that the population was 392,480 which averages about 1 inhabitant per square mile. This number was considerably increased during the past year. The following table shows the rapid increase in the population during the last forty years, especially after the completion of the first railway:

	1871	1881	1891	1901	1911
Male	36,249	29,503	63,003	114,160	251,619
Female		19,956	35,170	64,497	140,861

The last ten years, between 1901 and 1911, shows an increase of 119.68 per cent, and one can assuredly believe that the next decade will show even a greater increase in its population, as new districts are opened up by easier transportation and communication facilities.

The population is necessarily a cosmopolitan one, because the resources of the province are varied. Outside of English-speaking people and Indians, including half-breeds, the number of Chinese and Japanese rapidly increased until 1901. Statistics show the following results:

	1881	1901
British	14,660	106,403
Chinese and Japanese	4,350	19,482
Indians and Half-breeds	25,661	28,949

Fortunately the oriental races have not increased to any appreciable extent during the last few years—partly due to the tax of $500 per head imposed by the Dominion Government on Chinamen. In the last few years the whites in the labor markets have had to seriously compete with the influx of Japanese, and more especially with Mongolians who are able and willing to work for a comparative low wage. These difficulties are forcibly realized by the federal authorities and steps are being taken to exterminate this oriental menace. The Japanese in general are not so much disliked by the whites, because they adapt themselves quite rapidly to the customs of the white people, but in the cheaper variety of labor they still materially interfere with the scale of wages. The Indian is fast dying out so that the numbers are being annually reduced. This is an unfortunate thing because he has materially assisted in opening up to exploration many otherwise inaccessible portions of the northern part of the province.

Forests

The leading industry of this province is connected with the timber resources. According to latest reports there are over 182,750,000 acres of forest lands, of which at least 15 million acres contain merchantable timber. During the year 1911 over one billion feet of lumber were cut, valued at $24,833,000.

Forest fires have worked havoc throughout the province, destroying many thousands of square miles of forests. Many of these fires were caused during the construction of the main line of the Canadian Pacific railway. The government is now taking every care to protect this vast and luxuriant forest mantle. These forests can not last forever and unless some stringent means of conservation is at once followed out, the supply in the more accessible parts of the province will soon become depleted. The government now has nine forest reserves covering an area of 21,000 square miles. Much of the best forest land occurs on Vancouver Island and in the western half of the province. Generally speaking, the broad intermontane valleys and the lower slopes of many mountain ranges throughout the interior of the

province are thickly forested with a great variety of valuable timber. In many instances these forests are or soon will be easily accessible. The principal varieties of wood are the Douglas fir, which is the chief timber of commerce; Menzie's spruce, white and Engellmann's spruce, white mountain, black and yellow pines, giant cedar and yellow cedar, western white oak, western hemlock, western larch and alder. The first two varieties mentioned are especially characteristic of the western half of the Province. They sometimes attain a height of 300 feet and are frequently from eight to fifteen feet in diameter.

This industry has a brilliant future for the Province, because most of it is manufactured within the Province, and the market is very broad. At present the manufactured product is shipped to Australia, New Zealand, China, Japan, Fiji Islands, Peru, Chili, as well as many parts of Europe and the United Kingdom. The pulp industry although only in its infancy amounted to ten thousand dollars in 1909, and may in the future prove to be a valuable asset to the Province.

Minerals

The mining industry has a foremost place in the natural resources of the Pacific Province. Mining in some form has been carried on more or less vigorously since the Fifties. Omitting a few "rushes" for gold and platinum placers, the mining industry has gradually increased for the last forty years. Early mining consisted largely of placers and little or no lode mining was done until after 1882. During the year 1911, the minerals procured in order of value are coal, gold, copper, lead, silver, zinc.

Much might be written about the coal resources of the province, but in this short paper it will be sufficient to say that there is an enormous supply of coal, much of which is not yet opened up. The coal is largely Cretaceous in age and is a high grade bituminous and semi-anthracite variety. The main coal fields in operation are those on Vancouver Island, those west of the Crow's Nest Pass, and the Nicola and Princeton coal fields in central southern British Columbia. The Grand Trunk Pacific railway will open up new fields in the Bulkley Valley.

It has been estimated by the Geological Survey that the aggregate area of coal lands in British Columbia on the mainland is 1,351 square miles, containing 40,221 million tons. Of this amount there are sixty-one million tons of anthracite and 39,674 million tons of bituminous. This does not include the Vancouver Island coal fields, which have been producing for about fifty years. The output for 1910 amounted to over one million tons, or nearly one-third of the total output for that year. Much of the coal produced is shipped to the United States. There will always be a wide market for this commodity.

Agriculture and Fruit Growing

Although this Province is mountainous, it contains several tracts of

good farming land. Much of this land lies in broad valleys in the interior of the mainland. To quote one authority on this natural resource "There are upwards of 2,000,000 acres of land in the Province suitable for horticulture and anywhere from 50 to 100 million acres capable of being utilized for agricultural purposes."

In the southern part of the Province three large fruit growing valleys may be mentioned, Chilliwack, a branch of the Fraser valley; Okanogan in the interior, and the Columbia valley towards the east. One authority describes the latter as "a veritable Garden of Eden" waiting the husbandman's attention and containing from 800,000 to 1,000,000 acres of unsurpassable agricultural lands girt about by mountain scenery of incomparable grandeur —and with the promise too of immediate and exceptionally good transportation facilities." There are other equally large agricultural valleys in the Boundary district in the southern end of the Province and on the east side of Vancouver Island. Farther north in the valleys which are being opened up by the Grand Trunk Pacific and the Canadian Northern railways, and in the Peace River valley still farther north, there are several million acres of good agricultural land. The agricultural industry is just beginning to be developed, although the output for 1911 amounted to nearly 21 million dollars.

Fisheries

Another great natural resource of British Columbia to be mentioned here is the Fisheries industry, which had an output of eleven million dollars for 1911. Salmon is the chief product, and the "pack" for that year amounted to nearly one million cases. The fur-seal fishery, at one time a flourishing industry in this Province, is declining.

Scenery

Physiographically British Columbia includes from east to west a large part of the Rocky Mountain system, separated from the Purcell and Selkirk ranges and the Interior plateau by a broad depression known as the Rocky Mountain trough. This trough extends for a distance of over 600 miles northwest and southeast and is occupied in part by the Kootenay, Columbia, Fraser and Finlay rivers. To the west of the broad interior plateau lies the Coast Range, which to the south of the lower part of the Fraser valley, where the Canadian Pacific Railway is situated, is called the Cascade Range.

The magnificent scenery in the Rocky Mountains and in the Selkirks is ranked with the finest in the world. Among the highest peaks in the Rockies may be mentioned Mt. Robson (13,700 ft.), Mt. Columbia (12,740 ft.), Mt. Forbes (12,075 ft.), Mt. Assiniboia (11,866 ft.), Mt. Goodsir (11,676 ft.), Mt. Victoria (11,355 ft.), Mt. Sir Donald in the Selkirk range "looming 10,645 ft. above sea-level—silently tempts those who can to come

to him," and Mt. Fairweather (15,287 ft.), the highest in British Columbia, is on the International boundary line. All of these and many more equally as majestic are readily accessible, and attract each year many thousands of tourists. The magnificent grandeur of the scenery in the Canadian Rockies and Selkirks is such that it can not be accurately described and can only be appreciated by those who have seen these natural beauties. The reader, who has spent some time in these mountains, can best understand why the scenery of this mountainous Province is worthy of being classed as one of the natural resources.

The Yoho Park reserve covering 560 square miles, in the Rocky Mountain; the Glacier Park reserve of 468 square miles, in the Selkirk mountains, and Strathcona Park reserve enclosing 276 square miles in the heart of Vancouver Island, offer suitable and magnificent playgrounds for the tourist, pleasure seeker, or mountain climber.

Education and Expansion

The rapid development of British Columbia is also witnessed in educational lines. There has recently been opened the University of British Columbia, situated most beautifully and advantageously near the city of Vancouver. Previous to the formation of this new University there was the McGill University College of British Columbia, affiliated to McGill University, with its centre in Montreal. This new university is bound to grow rapidly, situated as it is in the midst of such a diversity of natural resources.

Other facts give evidence of development within the Province. In 1905 there were 1,627 miles of steam railway line completed, while in 1911 it had increased to 1,842 miles. In 1910 there were 100 miles of electric railway and the following year showed a completion of 183 miles. The Federal Government in 1911 controlled and operated 1,156 miles of telegraph service, and 22 miles of cable line.

The natural wealth of this Pacific Province is great enough to support a nation, but the development must necessarily be very slow, where it has to be carried on by a mere handful of people. There is today less than 1.5 per square mile. However, in spite of this fact, linked with the physical difficulties of the mountainous region, and lack of communication, as well as its being somewhat isolated geographically from the rest of the Dominion, much has been done to develop the natural resources.

It may be said that the placer mining "rush" of the Fifties and the completion of the Canadian Pacific Railway began the tale of progress in a great portion of this Province. One feels certain in saying that with railway extension, including the Grand Trunk Pacific and the Canadian Northern railways in the north, and the Great Northern and Crow's Nest Branch of the Canadian Pacific railways in the south, there is a brilliant future in store for this province.

LABORATORY MAP-EXERCISE

CANADA. PHYSICAL CONDITIONS AND HUMAN RESPONSES (*Based upon Rand, McNally and Company's New Physical map of North America. See explanation at bottom of the map for meaning of the various colors and symbols employed.*)

1. About what per cent of the area of Canada is below 1,000 feet in elevation?

2. Many plains are devoted to agriculture. Why is so little of this area unsuited to agriculture?

3. Account for the fact that the 60° isotherm for July and the line showing the northern limit of cereals are, roughly speaking, so nearly parallel. Why are these lines farther south in central and eastern Canada than in western Canada?

4. Explain the course of the 60° isotherm for July along the Pacific coast.

5. Explain the great southward bend of the 0° isotherm for January.

6. What is the cause of the heavy fogs which are so common off Newfoundland?

7. How does the area of Canada compare with that of the United States exclusive of Alaska? Compare population.

8. See an old map of Canada for the previous boundaries of provinces. Why was the change desirable?

9. Account for the irregular coast of British Columbia. Is the scenery of this coast an asset? Explain.

10. What name is applied to the shallow waters off Newfoundland? What large industry is carried on in these waters?

11. (a) What is the origin of the level plain around Lake Winnipeg? (b) How do you explain the fact that wheat matures as well here as it does in Kansas, much farther south?

12. Why is ranching the leading industry of the plains at the eastern base of the Rocky Mountains?

13. Compare Winnipeg with London as to latitude. Explain the difference in climate.

14. Explain the width of the lower St. Lawrence. How many miles farther east did this river formerly extend? (Note coloring south of Newfoundland.)

15. Why is the estuary of the St. Lawrence of less value to commerce than that of the Hudson?

16. Why are the Saskatchewan and Mackenzie of little value to commerce?

17. Note the width of the western mountain systems in Canada and in the United States, and point out what advantage the route of the Canadian Pacific has over that of the Union Pacific.

18. Why are there no cities on the eastern coast in the same latitudes as Juneau and Sitka in Alaska?

19. Where is the Klondike? For what noted?

20. What part of Canada is in the same latitude as Milwaukee? Why is their climate better suited to fruit raising than that of Wisconsin?

E. F. Bean.

A CORRECTION

In Professor Davis's article on The Rhine Gorge and the Bosphorus, in the March number of the *Journal* an unintentional error was introduced by the printer after the author had read the proof. On page 213 the third paragraph should indicate that the Rhine highland is divided into four unequal parts by the Rhine, Mosel, and Lahn rivers and that these divisions may be named as follows:—(1) the Taunus, or southern quarter, (2) the *Hunsruck*, or southwestern quarter, (3) the *Eifel*, or northwestern quarter, and (4) the *Westerwald*, or northeastern quarter.

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